



## COMPARATIVE STUDY OF ANTI-MICROBIAL PROPERTY OF HERBS & ITS INCORPORATION IN SUMMER RELAXING FOOT GEL

P. Hardas\*

\*Corresponding Author

S. Sahasrabudhe

### ABSTRACT

Use of plant parts as a source of medicine has been an ancient practice and is an important component of the health care system in India. Plants produce a whole series of different compounds which are not of particular significance for primary metabolism, but represent an adaptive ability of a plant to adverse abiotic and biotic environmental conditions. They can have a remarkable effect to other plants, microorganisms and animals from their immediate or wider environment. The traditional medicine involves the use of different plant extracts of bioactive constituents.<sup>(1)</sup> The present study was undertaken with an objective to find out the antibacterial activity of *Ficus racemosa* Linn, *Nyctanthes arbor-tristis* and *Manilkara zapota* leaves with standard antibiotic (tetracycline) against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* and *Candida albicans*. The best of these will be incorporated in Summer relaxing gel for Smelly feet.

**KEYWORDS** : *Ficus racemosa*, *Nyctanthes arbor-tristis*, *Manilkara zapota*, umber, night chickoo, antimicrobial property, disc diffusion, foot gel.

### 1. INTRODUCTION

Although natural ingredients have been traditionally used for centuries for skin care purposes, they are becoming more prevalent in contemporary formulations. The term "natural" is defined as something or an ingredient that is produced by the nature or found in nature and is directly extracted from plants or animal products. Sources of natural ingredients can include herbs, fruits, flowers, leaves, minerals, water and land.<sup>(2)</sup>

The use of plants for medicinal purposes is as old as humanity and, in the coming years, there will be continuation of the emergence on the market of new products containing natural oils and herbs. Plants were the main source of all cosmetics before the use of synthetic substances with similar properties.<sup>(3)</sup> Natural plant molecules remain particularly interesting for new research. However, the use of extracts requires paying special attention to the extraction methods, plant-to-solvent ratios and the content of active ingredients.

Plant extracts exhibit:

- direct antibacterial activity showing effects on growth and metabolism of bacteria
- indirect activity as antibiotic resistance modifying compounds which, combined with antibiotics, increase their effectiveness.

Antibacterial secondary metabolites are usually classified in three large molecule families: phenolics, terpenes and alkaloids.<sup>(4)</sup>

### 2. MATERIAL AND METHODS

#### *Ficus racemosa*

**Scientific name:** *Ficus racemosa*

**Common name:** Indian fig, Umber, Udumbara, Gular fig, Cluster fig, Country fig, Cluster Fig Tree, Goolar

**Family:** Moraceae

**Chemical constituents of leaves:** Tetra triterpene, tannins, glauanol acetate, racemosic acid.<sup>(5)</sup>

#### *Nyctanthes arbor-tristis*

**Scientific name:** *Nyctanthes arbor-tristis*

**Common name:** Tree of Sorrow, Night Jasmine, Coral Jasmine, Parijathak, Parijaat, Harsingar, Shephaali.

**Family:** Oleaceae<sup>(6)</sup>

**Chemical constituents of leaves:** Leaves contain D-mannitol,  $\beta$ -sitosterole, Flavanol glycosides, Astragaline, Nicotiflorin, Oleanolic acid, Nyctanthic acid, Tannic acid, Ascorbic acid, Methyl salicylate, Amorphous glycoside, Amorphous resin, Trace of volatile oil, Carotene, Friedelene, Lupeol, Mannitol, Glucose, Fructose, Iridoid glycosides, Benzoic acid.<sup>(7)</sup>

#### *Manilkara zapota*

**Scientific name:** *Manilkara zapota*

**Common name:** Chickoo, Sapodilla, Sapoti, Chikoo

**Family:** Sapotaceae

#### **Chemical constituents of *Manilkara zapota*:**

**Leaves:** Leaves contain phenolic compounds: D-quercitol methyl chlorogenate etc., tannins, Erythrodiol, oleic acid, linolenic acid and linoleic acid, lupeol acetate, oleanolic acid, palmitic acid,  $\beta$ -sterol, stigmasterol, hydrocarbons, ascorbic acid, carbohydrates, amino acid: aniline, arginine, leucine, tryrosine.<sup>(8)</sup>

#### **2.1. Collection and authentication of herbs:**

The leaves of *Ficus racemosa* (umber/ cluster figs), *Nyctanthes arbor-tristis* (night jasmine) and *Manilkara zapota* (chickoo) were collected from local garden in Nagpur.

The leaves were authenticated botanically, from the Department of Botany of Rashtrasant Tukdoji Maharaj Nagpur University.

### 3. METHODOLOGY

#### **3.1. Extraction of herbs**

The fresh leaves of Umber, Night jasmine and Chickoo were washed, cleaned and subjected to air dried in shade under normal environmental conditions for 3-4 days. The leaves were charged into Soxhlet apparatus, and sequential Soxhlet extraction of herbs was carried out on the basis of polarity of solvent, i.e; first from Water, then alcohol and later acetone. The extraction with each solvent was carried up to 25-30 cycles. Solvent was evaporated to obtain pure extract.<sup>(9)</sup>

#### **3.2. Phytochemical analysis of herbs**

The phytochemical analysis of the herbs were carried out which showed the presence of tannins, phenolics and terpenoids in water and alcoholic extract of all the three herbs.

#### **3.3. Antimicrobial assay of *Ficus racemosa* Linn and *Nyctanthes arbor-tristis***

Anti microbial activity of herbal extract was examined before

incorporation in the product using Disc diffusion method and zone of inhibition were noted.

**3.3.1. Procurement of organism**

The standard bacterial cultures used for this study were procured from MTCC. The cultures were subcultured and grown in nutrient agar medium.

**3.3.2. Microorganisms used**

*Pseudomonas aeruginosa, Staphylococcus epidermis, Candida albicans, Staphylococcus aureus.*

Standard antibiotic disc (tetracycline) was used for the control. Similarly all the other bacterial cultures were introduced in the plates and test samples were introduced and mark properly. All the above procedure was carried out in a laminar flow and in aseptic chambers. Plant extracts were tested in different concentration as 0.05% and 0.1%.<sup>(10)</sup>

**3.3.3. Zone of Inhibition:**

The zone of inhibition was observed on the next day (approx. after 24 hours), it was measured in millimeters with the help of scale. The zone of inhibition of extracts is mentioned from Table no.: 1-4

**Table 1: Comparison of Zone of inhibition for 0.05% aqueous extracts of herbs against organisms**

Zone of inhibition (mm)					
Sr. no	ORGANISMS	CONTROL	UMBER	NIGHT JASMINE	CHICKOO
1	C. albicans	30	14	10	-
2	P. aeruginosa	30	12	-	10
3	S. epidermidis	22	14	10	-
4	S. aureus	30	16	8	6

**Table 2: Comparison of Zone of inhibition for 0.1% aqueous extracts of herbs against organisms**

Zone of inhibition (mm)					
Sr. no	ORGANISMS	CONTROL	UMBER	NIGHT JASMINE	CHICKOO
1	C. albicans	36	16	12	-
2	P. aeruginosa	32	16	-	10
3	S. epidermidis	22	14	12	-
4	S. aureus	20	12	8	6

**Table 3: Comparison of Zone of inhibition for 0.05% alcoholic extracts of herbs against organisms**

Zone of inhibition (mm)					
Sr. no	ORGANISMS	CONTROL	UMBER	NIGHT JASMINE	CHICKOO
1	C. albicans	30	14	10	-
2	P. aeruginosa	26	12	-	10
3	S. epidermidis	20	14	8	-
4	S. aureus	24	10	8	6

**Table 4: Comparison of Zone of inhibition for 0.1% alcoholic extracts of herbs against organisms**

Zone of inhibition (mm)					
Sr. no	ORGANISMS	CONTROL	UMBER	NIGHT JASMINE	CHICKOO
1	C. albicans	34	16	10	8
2	P. aeruginosa	26	14	-	10
3	S. epidermidis	24	16	10	12
4	S. aureus	24	16	12	10

**4. RESULT INTERPRETATION:**

Referring the table no: 1-4, it was concluded that; the concentration of UMBER was seen effective against all the microorganisms, but the zone of inhibition was more and prominent in 0.1% aqueous and alcoholic concentration (Max. zone of inhibition: 16mm in UMBER).

When compared with standard (Tetracycline) it was observed that with increase in concentration there was no significant difference in zone of inhibition of both aqueous and alcoholic concentration. Further with these concentrations when product is prepared, the possibility of other ingredients to interact with active in product formulation cannot be denied and therefore, 0.1% aqueous and alcoholic concentration was preferred. In addition to that with 0.2% extract of both was also prepared.

**5. PRODUCT FORMULATION**

Many times, the product ingredients interacts with active or suppresses the active's activity, hence one more concentration was taken in consideration, i.e; 0.2%

A foot gel was formulated using aqueous and alcoholic UMBER extract as shown in table no: 5

**Table 5: Formulation table of Summer relaxing Foot gel using UMBER extract**

Sr. No	Ingredients	Quantity for 100 gms			
1	Carbopol 940	1	1	1	1
2	Triethanol amine	1	1	1	1
3	Propylene glycol	1.4	1.4	1.4	1.4
4	Water	Up to 100	Up to 100	Up to 100	Up to 100
5	Alcohol	5	5	5	5
6	Menthol	0.1	0.1	0.1	0.1
7	Methyl paraben	0.05	0.05	0.05	0.05
8	UMBER aq extract	0.1	0.2	--	--
9	UMBER alc extract	--	--	0.1	0.2
10	Raspberry red ®	Q.S	Q.S	Q.S	Q.S
11	Blue (oil soluble)	Q.S	Q.S	Q.S	Q.S
12	Perfume	Q.S	Q.S	Q.S	Q.S

100 gm of foot gel was formulated using 0.1 and 0.2% active

All the formulations were further studied for Microbial assay and zone of inhibition were noted in Table no: 6-7

**Table 6: Comparison of Zone of inhibition for Aqueous extracts of UMBER for Foot gel**

Zone of inhibition (mm)					
Sr. No	Organism	Positive Control	Negative Control	0.1%	0.2%
1	C. albicans	35	--	14	20
2	P. aeruginosa	30	--	18	18
3	S. epidermidis	15	--	14	18
4	S. aureus	22	--	15	18

**Table 7: Comparison of Zone of inhibition for Alcoholic extracts of UMBER for Foot gel**

Zone of inhibition (mm)					
Sr. No	Organism	Positive Control	Negative Control	0.1%	0.2%
1	C. albicans	32	--	14	20
2	P. aeruginosa	26	--	13	20
3	S. epidermidis	30	--	15	22
4	S. aureus	20	--	12	18

**6. RESULT INTERPRETATION**

Referring both the tables: 6 and 7; it was resulted that, in both the solvents, UMBER was seen effective against all microorganisms and was more effective and prominent at 0.2% alcoholic concentration.

It was seen by comparing table 7 and table 8 that; the zone of inhibition is slightly more in 0.2% alcoholic concentration than 0.2% aqueous concentration, which could be due to the synergistic effect by presence of alcohol in the product.

## 7. ACCELERATED STABILITY STUDY

For the base and base with active the accelerated stability studies were carried out for one month by keeping the samples at the different temperatures where it was found to be stable in terms of Colour, Odour and pH

## 8. DISCUSSION AND CONCLUSION

India has a rich source of plant biodiversity possessing tremendous medicinal properties. Umber, Night jasmine and Chickoo being found abundantly were selected for evaluation of anti-microbial property which could be due to the presence of different chemical agents classified as bioactive antimicrobial compounds. Hence the optimal effectiveness of plant may not be due to the main active, but could be due to combined action of these different compounds originating from herbs as tannins, phenols and terpenes.

The antimicrobial assay was reported in-between 0.08%-1% for these herbs, therefore an intermediate concentration as 0.05% and 0.1% was selected common for these 3 herbs.

When compared with standard (Tetracycline) it was observed that with increase in concentration there was no significant difference in zone of inhibition of both aqueous and alcoholic concentrations of Umber. 0.1% aqueous and alcoholic Umber extract being quite efficient when compared with Night jasmine and Chickoo. Hence was incorporated in gel formulation.

Further with these concentrations when product is prepared, the possibility of other ingredients to interact with active in product formulation cannot be denied and therefore, along with 0.1% aq and alc concentrations, 0.2% extract of both was also prepared.

The antimicrobial assay of product (Summer Relaxing Foot Gel) was conducted with 0.1% and 0.2% (both, aqueous and alcoholic extracts) active concentrations and it was found that 0.2% alcoholic active concentration was more effective and prominent, which could be due to the synergistic effect by presence of alcohol in the product.

With anti-microbial assay, these products were subjected to stability testing and were found to be stable with minimal changes in pH, ranging between 6-7. Organoleptically, the color, odor and texture showed no change and therefore stable.

The product idea for foot gel was preferred because feet are most negligible part in terms of care and hygiene. Workaholics or workaholic culture has made humans work in offices up to late night and the constant environment therefore provided to feet is damp, sweaty and dark inside close tight shoes, resulting in a favorable environment for bacterial action. This results in smelly feet and socks.

## 9. REFERENCE:

- Riberiro A.S., Estanqueiro M., Oliveira M.B. and Lobo J.M.S.; Main benefits and application of plant extracts in skin care products; [www.mdpi.com/journal/cosmetics](http://www.mdpi.com/journal/cosmetics); Vol: 2; 2015; 48-65
- Bobbarala V.; Antibacterial activity of naturally occurring compounds from selected plants; *Antimicrobial Agents*; Published by: Janeza Tradine 9, 51000 Rijeka, Croatia; 2012; 2-4
- Joy P.P., Thomas S., Mathew S., Skaria B.P.; *Medicinal Plants*; Kerala University; 1998; 3
- Menghani E., Ojha C.K., Negi R.S., Agarwal Y. and Pareek A.; Screening of Indian Medicinal Plants and their potential as antimicrobial agents; *Global Journal of Science Frontier Research*; Issue: 2; Vol: 11; 2011; 15
- Joseph B., Raj S.J.; Phytopharmacological properties of *Ficus racemosa* Linn – An Overview; *International Journal of Pharmaceutical Sciences Review and Research*; Issue: 2; Vol: 3; 134-138
- Jadhav S., Patil J.M.; A review on: *Nyctanthes arborvitris* Linn. Rejuvenating herbs; *International Journal of Research in Pharmacy and Pharmaceutical Science*; Issue: 1; Vol: 1; 2016; 54-62
- Desai S.V., Dhupal A., Chauhan P.S.; Literature review on *Nyctanthes arborvitris*; *International Journal of Pharmacy and Technology*; Issue: 1; Vol: 8; 2016; 3611-3628
- Dr. Parle M. and Preeti; Chickoo: A Wonderful gift from Nature; *International Journal of Research in Ayurveda and Pharmacy*; Vol: 6(4); 2015; 544-550
- Khadse K.; Study of Night Jasmine as an Antibacterial agent; Department of Cosmetic technology, L.A.D. and S.R.P. College for Women, R.T.M.N.U.; Nagpur; 2007-

- 2008  
10. Jain.P; Comparative study of Antimicrobial activity of different herb extract; Department of Cosmetic technology, L.A.D. and S.R.P. College for Women, R.T.M.N.U., Nagpur; 2015-16; 19-20